Revision Notes for Unit 4 VCE Psychology Exam
Monday 7 November, 2011 (3:00 - 4:45 p.m.)
Prepared by Ross Down

Area of study 1: Learning

Key knowledge:

This knowledge includes:

• behaviours not dependent on learning including reflex action, fixed action patterns and behaviours due to physical growth and development (maturation)

• mechanisms of learning:
- areas of the brain and neural pathways involved in learning, synapse formation, role of neurotransmitters
- developmental plasticity and adaptive plasticity of the brain: changes to the brain in response to learning and experience; timing of experiences
- use of imaging technologies in identification of localised changes in the brain due to learning specific tasks

• applications of, and comparisons of, learning theories:
- classical conditioning as informed by Ivan Pavlov: roles of neutral, unconditioned, conditioned stimuli; unconditioned and conditioned responses
- applications of classical conditioning: graduated exposure, aversion therapy, flooding
- three-phase model of operant conditioning as informed by B.F. Skinner: positive and negative reinforcement, response cost, punishment and schedules of reinforcement
- applications of operant conditioning: shaping, token economies
- comparisons of classical and operant conditioning in terms of the processes of acquisition, extinction, stimulus generalisation, stimulus discrimination, spontaneous recovery, role of learner, timing of stimulus and response, and nature of response (reflexive/voluntary)
- one-trial learning with reference to taste aversion as informed by John Garcia and Robert A Koelling (1966)
- trial-and-error learning as informed by Edward Lee Thorndike's puzzle-box experiment
- observational learning (modelling) processes in terms of the role of attention, retention, reproduction, motivation, reinforcement as informed by Albert Bandura's (1961, 1963a, 1963b) experiments with children
- insight learning as informed by Wolfgang Kőhler
- latent learning as informed by Edward Tolman

• the extent to which ethical principles were applied to classic research investigations into learning including John Watson's 'Little Albert' experiment

• research methods and ethical principles associated with the study of learning, as outlined in the introduction to the unit.

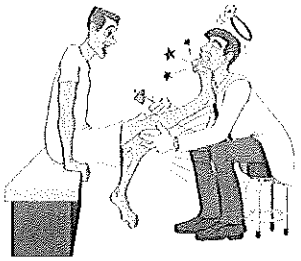
- **Behaviours <u>not</u> dependent on learning - reflex actions, fixed action patterns and behaviours that emerge due to (maturation)**

Learning may be defined as *a relatively permanent change in behaviour or knowledge that occurs as a result of experience.* This definition implies that learning is an ongoing process that continues throughout the life span, enabling us to adapt and cope in an ever-changing world. It also suggests that learning does not include the changes in behaviour that might be brought about by stress, fatigue, illness, disease or chemical substances. The notion of *change* is important to the definition. Something must be different about an organism after learning has taken place. The change is described as *relatively* permanent because learned behaviours may subsequently be modified. For example, a person with a fear of birds learned in early childhood, may subsequently learn not to fear them.

Learning may be *intentional* (eg. taking karate lessons) or *unintentional* (eg. inadvertently "picking up" the words to a song). Learning may be *active* (eg. learning the rules of Monopoly by playing it) or *passive* (eg. learning about the great depression of the 1930's by reading about it).

A distinction can be drawn between learned behaviours and non-learned behaviours such as reflex actions, fixed action patterns, and behaviour that depends on maturation.

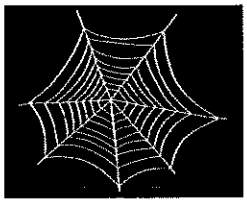
It is important to understand the definition of 'learning,' rather than simply memorising it. The definition has key words/phrases that help you understand the concept: '*relatively permanent*'; '*change in behaviour*'; and '*result of experience.*' And it is important to understand the different qualities of the behaviours described below and why they are *not* learned behaviours.



Reflex actions

Reflex actions are automatic or involuntary responses that do not require prior experience (eg. withdrawing one's hand from a hot object). For example, when someone blows a puff of air into your eyes, you normally display the reflex action of blinking.

Fixed action patterns



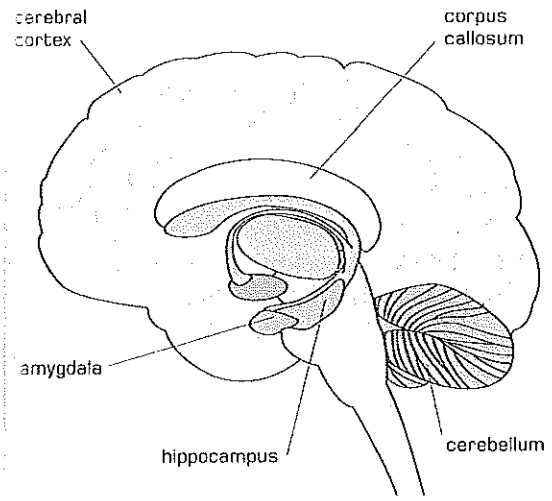
Fixed action patterns are inborn predispositions for organisms to behave in certain ways when appropriately stimulated. The term is used to describe behaviour that is inherited by every individual member of a species. This type of behaviour is also referred to as *instinctive* behaviour or *species specific* behaviour. For example, a young herring gull will peck at the red spot on its mother's beak when hungry.

Behaviour dependent on maturation (i.e. physical growth and development)

Behaviours dependent on maturation are those that depend primarily on the development of the body and the structures of the nervous system. For example, most children will begin walking at about 12-14 months and will be toilet trained between 18-30 months.

- **Mechanisms of learning**
  – areas of the brain and neural pathways involved in learning, synapse formation, role of neurotransmitters

The areas of the brain involved in learning depend largely on *what* is being learned – whether we're learning some new facts or a new skill.
Learning always involves interaction between brain regions too.
Some of the most important structures involved in learning are the:



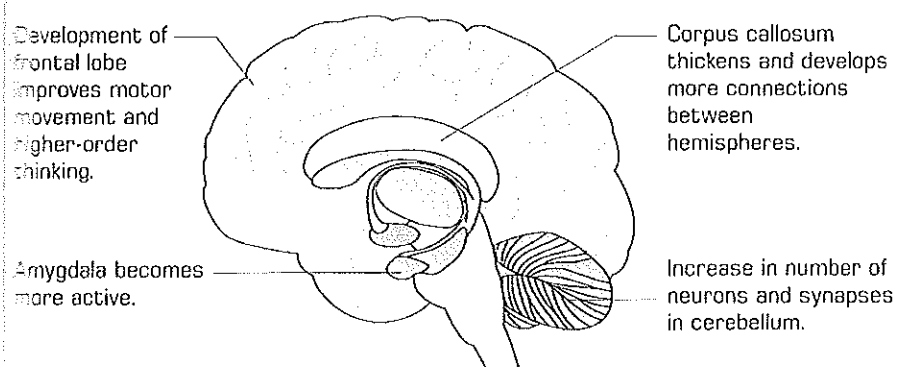
- ✓ **hippocampus**
- ✓ **amygdala**
- ✓ **lobes of the cerebral cortex**
- ✓ **cerebellum**

The hippocampus plays a central role in learning.
For new factual information to become a declarative memory, the hippocampus interacts with the relevant region in the cerebral cortex. - For example, the ability to remember the date of an upcoming concert we saw advertised in the newspaper, involves interaction between the hippocampus and the occipital lobes. Research has shown that humans and higher-order animals who sustain damage to their hippocampi, are able to feel the emotion of fear when they experience pain from a stimulus such as an electric shock that is heralded by the sound of a bell. However, they're not able to learn or remember to be fearful when placed in a situation again where they might receive an electric shock.
Learning the declarative (factual) information about pain being associated with the bell has to be processed by the hippocampus and if this is damaged, the organism is unable to learn and remember this information.

The importance of **the amygdala** is with emotional learning – eg. learning to associate fear with a new, unpleasant stimulus. Chimpanzees (or humans) with damaged amygdalas are unable to fear the impending electric shock, even though they know it's coming every time they hear the bell. So, if the hippocampus is intact and the amygdala is damaged, a person can learn to be fearful of the impending shock when they hear the bell, but they cannot display the physical signs of fear (eg. increased heart rate, blood pressure, etc.)

The lobes of the cerebral cortex contain many areas involved in learning and memory storage. One very important area is the basal ganglia (located in the frontal lobes) as they use information from the motor cortex as well as the somatosensory cortex to integrate message and produce smooth.
Diseases that damage this area of the brain include Parkinson's and Huntington's diseases, both of which cause great difficulty in learning to do tasks that would result in a procedural memory (eg. learning a new physical skill).

The cerebellum (located in the hindbrain) is involved learning motor skills, in the sequencing of muscular movement, balance and posture. It works together with the basal ganglia in learning movement sequences.



During adolescence, there is a lot of development in the four brain structures/regions above. There is also a thickening of the corpus callosum allowing more connections between the two hemispheres.

The neural basis of learning requires an understanding of neurons and how they communicate. – When neurons communicate, the **presynaptic neurons** send **neurotransmitters** from their **axons** that travel across the **synapse** to be received by the **dendrites** of the **postsynaptic neurons**.

Many areas of the brain are involved in learning because information from the senses is received and processed in different parts (as we learnt in Unit 3 in the first area of study). In addition, different brain areas interact with each other during learning as the exchange of information from one region to another is usually necessary. Some neurotransmitters have an **excitatory effect** and **stimulate neural impulses** in the postsynaptic neurons and other neurotransmitters have an **inhibitory effect** and **block neural impulses** from occurring in the postsynaptic neurons.

Two of the main neurotransmitters thought to be involved in learning are **glutamate** and **dopamine.** Learning a new task establishes new neural connections and practising it will strengthen those connections.

As learning new information occurs, the neurons form new connections with each other. This means that new appendages begin to grow from the axon terminal of presynaptic (sending) neurons towards the dendrites of neighbouring postsynaptic (receiving) neurons. As a result of learning, there is a strengthening of the neural pathway between neurons. This enables the newly learnt information to be transferred from one neuron to the next more efficiently. The more that a particular neural pathway is activated during learning the more likely it is to be strengthened.

– developmental plasticity and adaptive plasticity of the brain: changes to the brain in response to learning and experience; timing of experiences

Plasticity refers to the way our brain can alter itself (structurally and functionally) in response to stimulation from the environment.

Developmental plasticity – refers to the fact that a young person (infant or child) has a brain that is more adaptable to change – shows more plasticity – than that of an older person. The human nervous system begins to develop well before birth and even into early childhood, the neurons are still flexible in terms of the functions they (will) perform. Nervous system development goes through five stages:

1. **Proliferation** – the unborn baby's cells that will become neurons are dividing and increasing in number at a prolific rate – 250,000 cells per minute! Hence the term *proliferation* for this stage.
2. **Migration** - the newly formed neurons migrate outwards towards their ultimate destination. The role of the neuron will be determined by where it ends up being located.
3. **Circuit formation** – occurs when axons of new neurons extend towards target cells and form new synapses with them
4. **Circuit pruning** – a pruning of excess synapses and neurons that have not developed a connection with a target cell. This occurs during childhood and early adolescence.
5. **Myelination** – begins before a baby is born and continues through to late adolescence and early adulthood. It is the final stage to happen for the brain to become fully mature. Myelin is a white fatty substance that surrounds, or coats, the axons. Its function is to protect the axon from electrical interference from other neural signals and also to accelerate the speed of transmission of neural messages.

Adaptive plasticity – refers to **reorganisation** of the neural structure of the brain that can happen throughout the lifespan. This reorganisation refers to a shift in the connections that might change the function of a given area in the brain. Adults continue to develop new synapses as a result of their learning experiences and they also develop new synapses in response to brain injury as an adaptive mechanism – hence the term 'adaptive plasticity'.

Timing of experiences – As we grow, particular stages in development are especially suited to learning certain things. These optimum times are referred to as **sensitive periods**. The first year of life is often seen as a sensitive period for speech development, for example.

– use of imaging technologies in identification of localised changes in the brain due to learning specific tasks

Imaging technologies have helped overcome the limitations of other methods for undertaking research into the areas of the brain involved with learning.

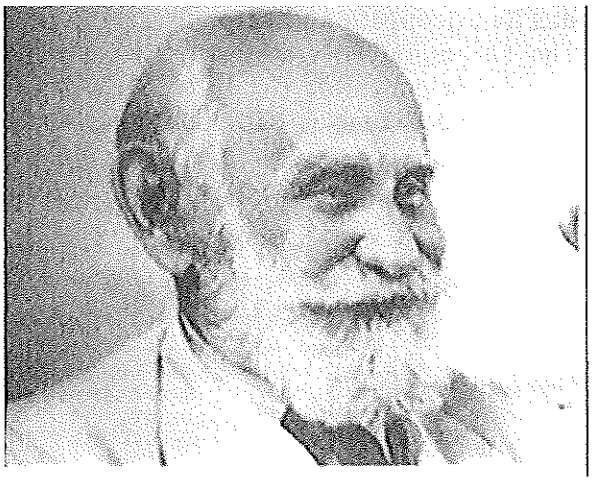
Imaging technologies such as PET and *f*MRI allow researchers to observe the changes in the brain that occur when and after learning takes place. Imaging technologies are also enabling researchers to see the exact areas of the brain that are involved in learning. For example studies of blood flow during a classically conditioned fear response has indicated the importance of the amygdala and hippocampus.

- **Applications of, and comparisons of, learning theories:**

– classical conditioning as informed by Ivan Pavlov: roles of neutral, unconditioned, conditioned stimuli; unconditioned and conditioned responses

Pavlov's experiments

Ivan Pavlov, a Russian physiologist, was conducting research on the digestive system in dogs at the end of the 19th century, when he noted that the dogs salivated *before* they received the meat powder stimulus that would normally produce salivation. This unintentional observation caused Pavlov to conduct many more experiments under controlled conditions to further investigate this phenomenon.



As a result of Pavlov's work, clear evidence was provided for a very simple type of learning that was based on the repetitive association of two different stimuli. The original *stimulus* (food) would normally produce an involuntary, automatic *response* (salivation) in Pavlov's dogs. The laboratory technician always prepared the food and delivered it to the dogs. His presence therefore always preceded the delivery of the stimulus that would cause the dogs to salivate. It was evident that the salivation response, which is biologically based in the nervous system and occurs involuntarily (i.e. a reflex response), had now been conditioned to a new stimulus (the sight or sound of the technician). This process was in essence, the process of *classical conditioning,* so named in honour of the work done by Pavlov in this area...

Key *elements* of classical conditioning

Classical conditioning is a simple form of learning that occurs as a result of the repeated association of two stimuli. One of the two stimuli would normally elicit a reflexive, involuntary or automatic response. This is called the *unconditioned stimulus* (UCS) since it does not need to be conditioned in order to elicit the involuntary response known as the *unconditioned response* (UCR).

The other stimulus is one that would *not* normally elicit a response. It is known at this stage as the *neutral stimulus* because it does nothing. Of the two stimuli, it is presented first so that the organism comes to anticipate the second stimulus (UCS) that triggers the unconditioned response. Acquisition of the conditioned response can said to have occurred when the organism continues to respond without the presentation of the unconditioned stimulus. That is, the organism responds to the formerly neutral stimulus alone. This stimulus can now be referred to as the conditioned stimulus (CS) and the response it produces is now called the

conditioned response (CR). Although the behaviour displayed in the response (salivation in Pavlov's experiments) remains the same, the name changes from unconditioned to conditioned because the response now occurs to a different stimulus than it did at the start of the procedure.
A classically conditioned response will rarely last forever in the absence of the unconditioned stimulus. In most cases, the withdrawal of the unconditioned stimulus will eventually lead to the *extinction* of the conditioned response.

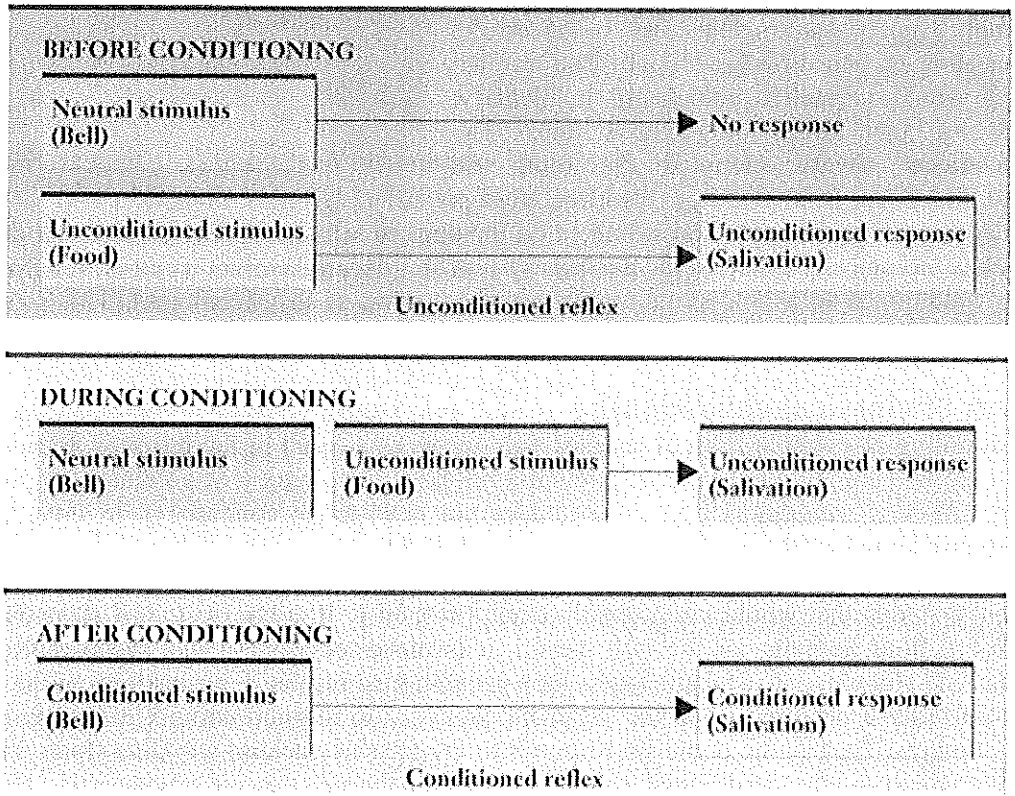
1. The conditioned (neutral) stimulus
The **conditioned stimulus (CS)** is the stimulus that is "neutral" at the start of conditioning and is often referred to at that stage as the *neutral stimulus*. It would not normally produce the conditioned response (CR), but does so eventually because of its repeated association with the unconditioned stimulus (UCS). In Pavlov's experiments this was a variety of stimuli including the laboratory technician, a bell and a tuning fork.

2. The unconditioned stimulus
The **unconditioned stimulus (UCS)** is any stimulus that consistently produces a particular, naturally occurring, involuntary, or automatic response. In Pavlov's experiments, the food (meat powder) was the unconditioned stimulus.

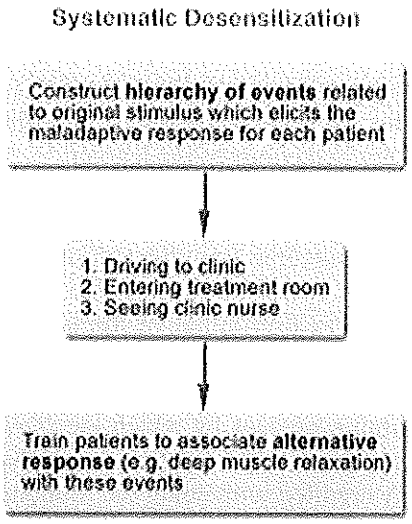
3. The conditioned response
The **conditioned response (CR)** is the behaviour that is identical to that of the unconditioned response but is caused by the conditioned stimulus (CS) *after* conditioning. In Pavlov's experiments salivation in response to any of the conditioned stimulus (laboratory technician, bell, tuning fork, etc.) was the conditioned response.

4. The unconditioned response
The **unconditioned response (UCR)** is the response that occurs automatically when the unconditioned stimulus is presented. The UCR is a reflexive or involuntary response as it is predictably caused by an unconditioned stimulus. Salivation to the meat powder was the UCR in Pavlov's experiments.

The process of classical conditioning

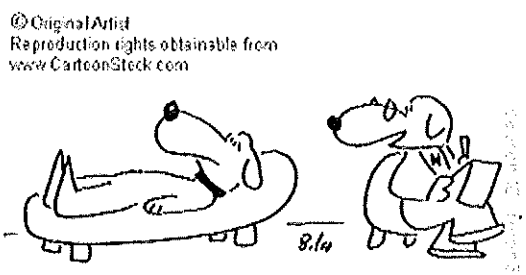


– applications of classical conditioning: graduated exposure, aversion therapy, flooding



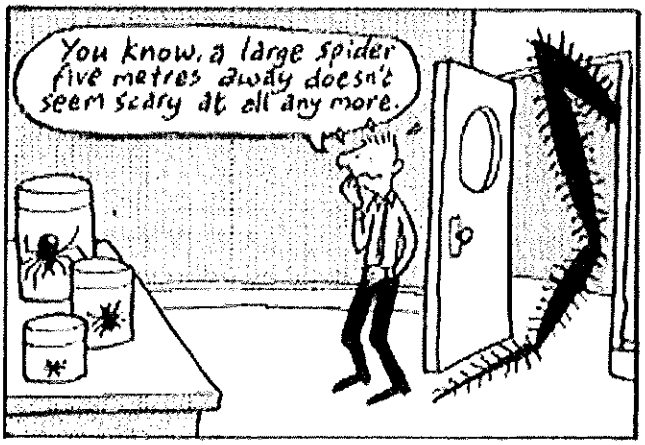
Graduated exposure is the part of **systematic desensitisation** that uses the progressive exposure to a feared object over time. The other part of systematic desensitisation is the learning and use of relaxation techniques that become associated with each stage of the graduated exposure. As a therapy it attempts to rid an individual of a classically conditioned fear response. Normally, withdrawal of the UCS (presentation of the CS alone) will eventually cause extinction of the CR. However, sometimes the CR persists, causing fear and anxiety for a long period. Psychologists have developed a therapy called *exposure therapy* which involves presenting successive approximations of the CS, beginning with the least provocative approximation and eventually (after a number of steps) presenting the CS to which the person had been fearful. For example, with a classically conditioned fear of flying, the initial approximation might be simply looking at plane fares on the internet. Progressive steps such as a trip to the airport and after several other intermediate steps, ultimately a trip on a plane would be taken. This gradual step-by-step exposure to the original CS provides the opportunity for the sufferer to confront their fears in a supported and gradual manner.

Aversion therapy is a form of behaviour therapy that applies classical conditioning principles to reduce or stop an unwanted behaviour by associating it with an unpleasant stimulus. Habits such as gambling and smoking, and obsessions such as compulsive hand washing (in obsessive-compulsive disorder), and eating disorders are all examples of harmful behaviours. Drugs may be paired with alcohol consumption to make an alcoholic feel nauseous. The alcohol becomes the CS having been neutral initially, to the extent that it did not originally cause any nausea. However, after repeatedly pairing it with a drug (UCS) that automatically causes nausea (UCR), a mental association is soon established between the two stimuli.



"I'm going to try aversion therapy... Bad dog! Bad dog!"

Flooding (sometimes called 'implosive therapy') involves bringing the patient into direct contact with the object of fear and keeping them in contact with it until the conditioned response has been extinguished. This contact may last for hours. Because of the confrontational nature of this therapeutic technique, it is almost the opposite of graduated exposure.

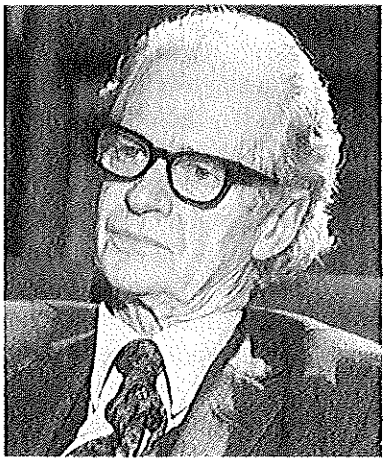


- **three-phase model of operant conditioning as informed by B.F. Skinner: positive and negative reinforcement, response cost, punishment and schedules of reinforcement**

The three-phase model of operant conditioning (D-B-C) refers to:

i. **Discriminative stimulus (Skinner referred to it as the *antecedent condition*)** – this is the condition that predicts the voluntary behaviour of the learner.
ii. **Behaviour (Skinner referred to this as the '*operant*')** - this is the voluntary behaviour that is performed by the learner.
iii. **Consequence** – this is the outcome from the voluntary behaviour

For example, a smile from a stranger (discriminative stimulus/antecedent behaviour) may lead you to speak to them (voluntary behaviour) which may result in a relationship with that person (consequence).



Operant conditioning is a learning process by which the *likelihood* of a particular behaviour occurring is determined by the *consequences* of that behaviour. The person generally credited with being the founding father of operant conditioning was American psychologist, B.F.Skinner (1904-1990). Skinner coined the term 'operant conditioning' to explain his work because in this type of learning, behaviour *operates* on the environment.

As a pure Behaviourist, Skinner believed that the explanation of *all* behaviour can be reduced to the relationships between the *behaviour*, its *antecedents* (the events that precede it), and its *consequences*. He contended that any behaviour that is followed by a consequence will alter in frequency of occurrence. The extent to which this frequency is altered depends on the nature of the consequence. Skinner believed that there was no need to search for internal agents to explain changes in behaviour.

An **operant** is a response (or set of responses) that occurs in the absence of any stimulus and acts upon the environment in the same way each time. Skinner designed an apparatus, now known as a *Skinner Box* (see Figure 5). This is a small soundproof chamber in which an experimental animal learns to make a particular response for which the consequences are controlled. It is usually equipped with a small lever that dispenses food or water into a dish when pressed. Some have lights and buzzers, and others are built with grid floors through which mild electric shocks can be administered. The lever is usually wired to a cumulative recorder -- an instrument with a constantly moving piece of chart paper, upon which a pen makes a mark to record each occasion the desired response occurs. Modifications were later made to these boxes to accommodate pigeons that were required to peck at a disk, rather than depress a lever.

In 1938, Skinner used this apparatus in a classic experiment to demonstrate operant conditioning. A hungry rat was placed in the box. The animal indulged itself in random behaviour, such as scurrying around the box in a seemingly purposeless fashion. Eventually, it accidentally pressed the lever, and a pellet of rat food fell into the dish beneath it. The rat continued its movements again until it struck the lever again and was once more rewarded with a food pellet. After many "trials" of random behaviour and intermittent lever pressing (which was always rewarded with a pellet of food), the rat's behaviour became less and less "random" and was eventually replaced by constant lever pressing.

This fundamental procedure has been repeated thousands of times by Skinner, his colleagues and most undergraduate students of psychology. It is from this experiment, and those similar to it, that the principles of operant conditioning have been derived and generalised to human behaviour.

Although Skinner's thinking about operant conditioning has been criticised more recently for being too narrow, the application of his basic principles is widespread in both the animal and human world.

Key *elements* of operant conditioning

It is important to remember that certain terms are common to both classical and operant conditioning; namely: *stimulus generalisation, stimulus discrimination, extinction* and *spontaneous recovery*. Other elements are more specifically operant conditioning terms; such as positive and negative reinforcement, punishment, shaping, and chaining.

Reinforcement is any stimulus (event or action) that subsequently *strengthens or increases* the likelihood of a response (behaviour) that it follows. The stimulus is referred to as the **reinforcer** and one of the distinguishing features of operant conditioning is that the reinforcer comes *after* the response (behaviour). In classical conditioning the reinforcer comes before the response (behaviour). The reinforcer is the unconditioned stimulus since this is the stimulus that *always* elicits the response. It is not a reinforcer in the true sense of the word though because it can't really make the behaviour occur any more often, since the behaviour happens in response to it every time anyway.

Remember that anything that is *reinforced* is *strengthened*. The strengthening of behaviour means that it will occur more often.

A **positive reinforcer** is a stimulus that strengthens a response by providing a pleasant or satisfying consequence. For the rats in Skinner's experiments, the positive reinforcement was the food pellets in the food box that were given when the animal pressed the lever. For you, as a VCE Psychology student, an A+ would be an appropriate positive reinforcement for the study (behaviour) you have undertaken in preparing for the November examination.

A negative reinforcer is a stimulus that strengthens a response by the removal, reduction, or prevention of an unpleasant stimulus. That is, the behaviour undertaken to remove, reduce or prevent the unpleasant stimulus is strengthened by the consequence. In Skinner's experiments he sometimes electrified the grill on the floor of the box. The rat could stop the electrical current by pressing the lever. This lever pressing behaviour became more frequently displayed once the rat was operantly conditioned and therefore acted as a negative reinforcer to remove the unpleasant stimulus. Similarly in human behaviour, a person who has received several speed camera fines might find the use of a cruise control (to govern the vehicle's speed) a negative reinforcer. By using the cruise control, the driver is less likely to receive hefty fines and this behaviour (using the cruise control) will increase.

'Negative reinforcement' is one of the least understood key terms. It may seem natural to think that 'negative' equates to a decrease in the behavioural response, but the overriding factor is that any sort of reinforcement will *strengthen* behaviour. The words positive and negative simply refer to the *way* in which the reinforcement occurs.

Schedules of reinforcement

Schedules of reinforcement refer to the frequency and manner in which a response is reinforced. The following reinforcement schedules may be used with operant conditioning:

1. Continuous reinforcement - refers to a schedule in which a correct response is reinforced every time it is given.

2. Partial reinforcement - refers to a schedule when only some correct responses are reinforced. Responses conditioned under partial reinforcement are usually stronger (take longer to extinguish) than those under continuous reinforcement. Partial reinforcement may be administered via a range of schedules:

a) A **fixed interval schedule** is one in which reinforcement is delivered after a fixed time period (eg. every 10 seconds). This schedule generally produces a moderate response rate that is often erratic or irregular. Normally, once the organism realises that time is the governing factor, the response rate drops soon after

the reinforcer has been administered and then increases as the time for accessing the next reinforcer approaches. When you are at a pedestrian crossing waiting for the green "Walk" sign to light up, you might press the button a few times in quick succession. However, because the lights are programmed to operate on a fixed time interval, your efforts are futile as no amount of button pressing will hasten the change from "Don't Walk" to "Walk."

b) A **fixed ratio schedule** is one in which reinforcement is delivered after a fixed number of correct responses (eg. every 10th response). Because this schedule is so predictable, it is generally very effective whilst learning is taking place (the acquisition phase); although the frequency needs to be relatively high so that the learner does not get frustrated waiting. Once the acquisition phase is complete, the frequency can be reduced somewhat as the organism feels confident that the reinforcer will come after a certain number of correct responses. If you have ever picked fruit, sold newspapers, or recycled aluminium cans, your monetary reward (positive reinforcement) would have been on a fixed ratio schedule. That is, the more you pick, sell, or collect to sell to the recycler, the more you will get in return. The return is a fixed ratio (number) such as $5 per 20 kg of aluminium cans or maybe $20 for every 100 newspapers sold.

c) A **variable interval schedule** is one in which reinforcement occurs on an *average time* interval, but not with regular or set frequency (eg. on an average of every 10 seconds but with variations from 4 -16 seconds). This schedule generally produces a low but stable rate of response and the behaviour is extinguished more slowly than under a fixed interval schedule. If you have ever dialled a busy phone number repeatedly, waiting to get connected to the person on the other end, then you have experienced a variable interval schedule. You have no predictability of *when* (time interval) you'll get through, but you know that you will eventually, so you generally keep redialling.

random ratio.

d) A **variable ratio schedule** is one in which reinforcement occurs on the basis of an *average number* of correct responses, but is not regular in its occurrence (eg. on an average of every tenth response, but with variations from the 2nd to the 18th response). This schedule produces a quickly acquired response and one that is generally difficult to extinguish. Poker machines operate on a variable ratio schedule. The payouts are set to occur on average about once in every six turns, but they vary markedly in frequency (and in this case, in size of reinforcer!). This unpredictability of the positive reinforcer (money) seems to lure participants more strongly than a fixed ratio schedule that would be impractical for a poker machine.

The schedules of reinforcement have been popular with examiners. It's important that you understand *the effects on the learner* of each type of schedule – eg. the speed of acquisition of the behaviour or the strength of the learned behaviour as measured by its resistance to extinction.

Punishment

A **punishment** (or **punisher**) is any stimulus that is unpleasant and which generally *decreases* the likelihood of the behaviour recurring. Like a reinforcer, it is a consequence that generally needs to be administered immediately after the undesirable behaviour has been displayed. It also needs to be given consistently or the undesirable behaviour may return to its original frequency.
Just as reinforcement can be *positive* or *negative*, so too can punishment.
Positive punishment (more commonly referred to simply as **punishment**) occurs when an unpleasant consequence is given for an unwanted behaviour (eg. bad tasting "paint" on your nails for biting them).
Negative punishment occurs when a pleasurable object or event is taken away for an unwanted behaviour (eg. loss of your mobile phone for exceeding your monthly cap by a significant amount). This is more commonly referred to as **response cost.**

Potential punishers are any consequences that might lead to a decrease in a given response. It is therefore important to know the participant being operantly conditioned sufficiently well to judge the type of consequences that will be pleasant or unpleasant. For example, a quiet student who is "fussed over" by the teacher every time she offers a response in class may shun such attention and see it as threatening (punishment) rather than rewarding (reinforcing) as the teacher had intended it.

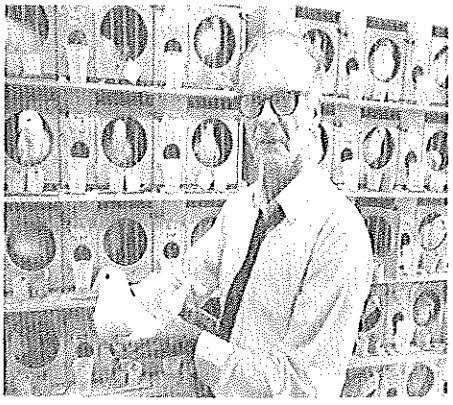
Side-effects of punishment include frustration and aggression which may develop in a child who is punished frequently. It may also be the case that administering the punishment is an outlet for the frustrations of the punisher. Consequently, punishment may increase simply because it makes the punisher feel better, rather than because the person being punished deserves it or because it decreases the likelihood of the undesirable behaviour.

Punishment versus negative reinforcement

Negative reinforcement (like positive reinforcement) *increases* the probability of a response occurring, whereas punishment aims to *decrease* the probability of the response occurring.
Although both negative reinforcement and punishment involve an unpleasant stimulus, punishment occurs when this *unpleasant stimulus follows the response* (eg. inappropriate behaviour), whereas negative reinforcement occurs when *the response avoids or stops an existing unpleasant stimulus.*

– applications of operant conditioning: shaping, token economies

Shaping is a procedure in which a reinforcer is given for any response that successively approximates and ultimately leads to the desired response or target behaviour. Because of the very nature of this procedure, it is also known as the *method of successive approximations.* Skinner used shaping to teach a pigeon to turn a complete circle in an anti-clockwise direction. That is, the pigeon was initially reinforced (via food pellets) for a slight turn to the left. Next time it was rewarded it had to turn further than it did for the previous reward. By reinforcing the bird for successive approximations of the target behaviour, Skinner was able to condition it to eventually turn a complete circle anti-clockwise in order to receive its reward. Shaping has been used widely in training animals because reasonably complex behaviours can be conditioned.



A token economy is a term used in a situation where a real economy is partially simulated on a miniature scale. Normally, individuals receive tokens for appropriate behaviour and these tokens can be collected and exchanged for more tangible rewards. Tokens may also be withdrawn and individuals can be fined in tokens for inappropriate behaviour.

– comparisons of classical and operant conditioning in terms of the processes of acquisition, extinction, stimulus generalisation, stimulus discrimination, spontaneous recovery, role of learner, timing of stimulus and response, and nature of response (reflexive/voluntary)

<u>Classical Conditioning</u> -
Acquisition refers to the phase when the organism is *acquiring* (or gaining) the response that it will eventually learn. It is the period during which the conditioned stimulus and the unconditioned stimulus are paired together many times.

Extinction occurs in classical conditioning when a conditioned response no longer occurs. It occurs over a period of time after the unconditioned stimulus (which acts as the reinforcer) is withdrawn and the conditioned stimulus alone continues to be presented.

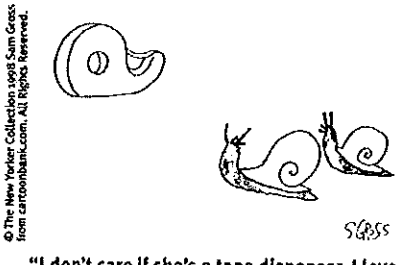
Extinction is not necessarily permanent. **Spontaneous recovery** of the conditioned response may occur after the response appears to have been extinguished. After a rest period from the presentation of the conditioned stimulus alone, the organism may once again show the conditioned response when the conditioned stimulus is presented. The response that occurs with spontaneous recovery is usually weaker in strength and of a lesser duration than the original conditioned response.

Stimulus generalisation refers to the tendency for another stimulus (similar to the conditioned stimulus) to also produce the conditioned response. In classical conditioning, a response that has been conditioned to a particular CS will often be produced for other stimuli which resemble it; for example, a bell with a slightly different pitch, volume, or duration. Generalised stimuli often elicit a conditioned response that is measurably weaker in strength than that elicited by the original conditioned stimulus.
Stimulus discrimination occurs when an organism responds to the conditioned stimulus, but not to a stimulus that is similar to the conditioned stimulus. For example, a dog may be conditioned to respond to the sound of a particular bell, but it will not respond to other "bell-like" noises, such as a doorbell, a bicycle bell, or a microwave bell.

<u>Operant conditioning -</u>
Acquisition is the establishment of the desired response through reinforcement. The schedule of reinforcement is important here because during the acquisition phase of operant conditioning, a *continuous schedule* of reinforcement will cause the response to be learned fastest.

Extinction is said to have occurred when the operantly conditioned response disappears over time as reinforcement ceases. Extinction usually occurs over a period of time and is indicated by the weakening of the response and/or the rate with which the response occurs. It is brought about by consistently *not* presenting the reinforcer. For example, how long would people continue going to work if their employer withheld their wages?
Spontaneous recovery refers to the reappearance of an extinguished behaviour after a rest period. The behaviour appears without the reinforcer but is usually weaker in strength and rarely lasts very long.

In operant conditioning **stimulus generalisation** refers to responding to stimuli which approximate the original stimulus; that is the generalised stimulus also produces an increase in the likelihood of the behaviour recurring, but usually the response is not as strong as the original stimulus. Suppose a pigeon had been operantly conditioned to peck at an orange light (original stimulus) to get food pellets (reinforcer) whenever it flashed. The pigeon may generalise this stimulus to one that is similar, say, a yellow light. The further away from the original stimulus the colour of the light becomes, the less likelihood there is of the pigeon pecking it.
Stimulus discrimination refers to the organism's ability to learn



"I don't care if she's a tape dispenser. I love her."

which responses will be reinforced and which won't. When it can reliably perform the behaviours which will be reinforced and not perform those which won't, then discrimination is evident. Skinner was able to teach pigeons to discriminate between a red light stimulus and a green light stimulus by always being reinforced for pecking a disk when a green light illuminated, but never reinforcing it for pecking at the sight of a red light.

The role of the learner is passive in **classical conditioning.** Pavlov's dogs didn't (voluntarily) do anything for learning to occur. There is no deliberate action on behalf of the learner.
The role of the learner is active in **operant conditioning.** Skinner's rats and pigeons had to volunteer the desired behaviour in order to be rewarded with a positive reinforcer.

The timing of the stimulus and response – In **classical conditioning,** the stimulus comes before the response (reflexive behaviour). In **operant conditioning,** the response (voluntary behaviour) occurs in the presence of the discriminative stimulus - the environment that predicts and provokes the response.

The nature of the response is **reflexive in classical conditioning** and **voluntary in operant conditioning.**

A Summary of Classical Conditioning versus Operant Conditioning

Classical conditioning	Operant conditioning
The organism is *passive* when either the CS or UCS is presented.	The organism must be *active* to receive the reinforcement or punishment.
Only involuntary responses are involved.	May involve *both* voluntary and involuntary responses.
Response (eg. salivation) *depends on* the *reinforcement* being presented (i.e. UCS or meat powder).	*Reinforcement* (eg. food pellet) *depends* on the *response* being made (eg. lever press).
The reinforcer is the UCS and this *precedes* the response.	The reinforcer *follows* the desired response.
A *specific stimulus* results in a particular response.	*No specific stimulus* produces a particular response.
One stimulus *substitutes* for another.	*No substitution* takes place.
In humans, *emotions* such as fear (which are associated with the autonomic nervous system) are primarily involved.	Responses associated with *goal-seeking* behaviour is primarily involved.
One reinforcer can elicit only *one type of response* (eg. food leads only to salivation).	One reinforcer can be used to strengthen a *wide variety of responses* (eg. money for completing homework or tidying room).

– one-trial learning with reference to taste aversion as informed by John Garcia and Robert A Koelling (1966)

John Garcia

One-trial learning is a particular type of learning that involves a change in behaviour as a result of just one trial or event. It is generally a conditioned physical response that results when the outcome for the organism is particularly significant. That significance may be associated with something extremely pleasant or with something extremely unpleasant (as is the case with a *taste aversion*).

A **taste aversion** is a learned response in which the organism associates a particular taste (of some sort of food) with being or feeling ill. This association is usually a 'once-off' occasion, yet the food is avoided from that time on. Taste aversions can be used positively to prevent the death of young animals such as lambs. Predators such as foxes are given lamb meat laced with a substance (lithium chloride) that causes extreme nausea and vomiting. They quickly establish an aversion for the taste and smell of lamb.

There is still much debate as to whether one-trial learning is a particular type of classical conditioning or whether it is another type of learning. The strength of the *association* between the two stimuli suggests it is a form of classical conditioning, but other aspects of one-trial learning suggest that it is not. Classically conditioned responses typically take a number of pairings of the CS with the UCS before a conditioned response is acquired. And although one-trial learning occurs so quickly, it is usually extremely difficult to extinguish. Classical conditioning can normally be extinguished by ceasing the presentation of the UCS, but with one-trial learning years can pass with no presentation of the UCS, yet the aversion remains firmly in place. The UCS and the UCR usually occur very close together in classical conditioning. For example, the presentation of the meat powder (UCS) is soon followed by the salivation (UCR). In one-trial learning, the time between the UCS (the bacteria in the food) and the UCR (vomiting) may be several hours or even a day apart. The CS can often be generalised in classical conditioning, but is rarely generalised in one-trial learning. However, both classical conditioning and one-trial learning involve involuntary, automatic responses that come about via a passive procedure. The organism doesn't really have to make any effort for the learning to occur.

The best known study of a conditioned taste aversion was that conducted by Robert Koelling and John Garcia. They conducted a study with thirsty rats.

In the *preconditioning phase*, rats drank saccharine flavoured water. Drinking the water activated a flashing light and a clicking sound but the rats drank the water without appearing to be bothered by the visual and auditory stimuli.

In the *conditioning phase,* the rats were allocated to two different conditions:

1. Saccharine flavoured water + flashing light + clicking noise + mild electric shock
2. Saccharine flavoured water + flashing light + clicking noise + exposure to radiation that made them sick 30 mins. later.

In the *test phase*, all the rats were returned to the preconditioning setting where two more presentations of water were made:

1. They were presented with *saccharine flavoured water* which was *not* accompanied by the flashing light or clicking sound each time they drank.
2. They were presented with *unflavoured water* which *was* accompanied by the flashing light and the clicking noise each time they drank.

Results:
Rats from condition 1 in the conditioning phase (saccharine flavoured water + light + noise + shock) would *not* drink the *plain water* but *would* drink the *saccharine flavoured water.*
Rats from condition 2 in the conditioning phase (saccharine flavoured water + light + noise + radiation induced sickness) would *not* drink the *saccharine flavoured water* but *would* drink *plain water.*

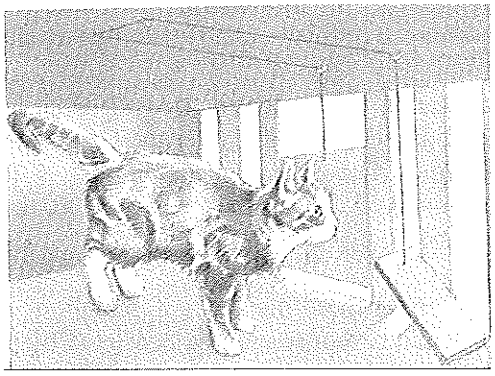
Conclusion:
Condition 2 rats had associated saccharine flavoured water with the radiation induced sickness
Condition 1 rats had associated the flashing light and the clicking sound with the pain of the electric shock.

The Condition 2 rats had taken just *one association* between the saccharine flavoured water with the radiation induced sickness – even though these rats had been willing to drink the saccharine flavoured water before the aversive consequence occurred.

– trial-and-error learning as informed by Edward Lee Thorndike's puzzle-box experiment

Trial and error learning occurs when an organism attempts to learn by undertaking a number of alternative behaviours (*trials*) and makes a number of incorrect choices (*errors*) before the desired behaviour is learned. Trial and error learning involves a desire to reach some sort of goal (*motivation*) by the learner. It also involves the learner trying a number of different behaviours (*exploration*). And when the correct response is finally achieved, it is rewarding for the organism (*reinforcement*).

Thorndike's puzzle-box experiment



American psychologist, Edward Thorndike made studies of trial and error learning around the same time as Pavlov was investigating the digestive system of dogs. Thorndike was studying animal intelligence and used cats as subjects in a puzzle box experiment. The cats had to be hungry (their motivation) and they had to be rewarded for acquiring the correct behaviour – this was achieved by providing a meal of fish for the cat if/when it escaped from the puzzle box. Of course, escaping from a confined space was also a reward. When the cat was placed in the box, it made numerous attempts to escape. The box had wooden vertical slats (not solid walls) so it could both see and smell the fish but it was beyond its reach. Thorndike measured the time it took the cat to escape from the box on each trial. To escape, the cat needed to push a wooden lever down. The lever was like a paddle that was attached to a pulley device that raised the "door" when it was pressed. The first time the cat escaped, the lever had eventually been pressed after a number of different behaviours. It is unlikely the cat made the mental connection between the lever and its escape until it had done it a couple of times. Once the connection was formed, the cat would press the lever deliberately as soon as it was placed in the box.

The results of experiments like these led Thorndike to describe his law of effect. The **law of effect** states that if a behaviour is followed by satisfying consequences it is strengthened (that is, more likely to occur again), whereas behaviours followed by unpleasant consequences are weakened (that is, less likely to occur). To describe the process of an organism learning to associate its behaviour with the consequences of it, Thorndike coined the term *instrumental learning.*

Law of Effect:

Behaviour >>>>>>>>>>Pleasant consequences ===➔Increased likelihood of occurring

Behaviour >>>>>>>>>>Unpleasant consequences =➔Decreased likelihood of occurring

- observational learning (modelling) processes in terms of the role of attention, retention, reproduction, motivation, reinforcement as informed by Albert Bandura's (1961, 1963a, 1963b) experiments with children

Observational learning occurs when someone uses observation of another person's actions and their consequences to guide their future actions. Because the person being observed is referred to as a *model*, observational learning is often called *modelling*. This is not to say that every time we watch someone do something we learn how to do it. Observational learning is a more active process than either classical or operant conditioning, although it is not entirely different from conditioning.

Albert Bandura, a Canadian-born psychologist performed extensive research into observational learning. His studies have shown that we learn a great deal of behaviour by observing others and by noting the consequences of their behaviour. This is called vicarious conditioning and it may involve either classical or operant conditioning. **Vicarious conditioning** involves a person observing the consequences (reinforcement or punishment) and then modifying (changing) their own behaviour according to those consequences experienced by the model.

Key *processes* in observational learning

The learner plays an *active* role in the learning process. They must:

(a) pay *attention* in order to observe the modelled behaviour. -- Attention may be influenced by numerous factors, (eg. the motivation and interest level of the observer or the personality characteristics of the model). Avoidance of distracters is therefore vitally important to observational learning.

(b) mentally represent and *retain* what has been observed. -- Responses learned by modelling are often not needed until sometime after they have been acquired. Therefore, memory plays an active role in observational learning. There is a need to make a mental representation of what you have observed, and the more meaningful you can make that image, the more accurately you will be able to replicate the behaviour when necessary.

(c) convert these mental representations into actions (i.e. *reproduce* them). -- Your ability to reproduce the modelled response may be restricted by physical limitations. For example, no matter how indelibly the skills of an AFL footballer are imprinted in an observer's memory, it is unlikely that they will be reproduced with the same prowess.

(d) be aware that *reinforcement* influences the learner's *motivation* to perform the learned behaviour. -- Unless the behavioural response provides a reward for you, it is unlikely that you will want to learn it. The last of these four basic processes therefore involves incentives or reinforcement -- the key link between observational learning and conditioning.

Bandura's experiments

Bandura's experiments were conducted at Stanford University (USA) in the 1960's. They involved a series of experiments on observational learning with children. A summary of 4 of these experiments is below:

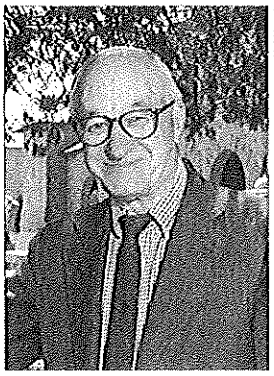
1. **Bandura's 1961 experiment:**

Participants – 36 boys + 36 girls aged between 3 - 6 years chosen from the nursery school at Stanford University. Nursery school teacher tried to balance the 3 groups - each comprising 12 boys + 12 girls – by rating them on personality characteristics.

Method – Independent groups design used. Participants observed model's behaviour.

Experimental conditions –

Group 1: No model observed. Each child sat in the room alone for 10 mins. with no adult present.
Group 2: Aggressive model observed.
Group 3: Passive model observed.


Dr. Albert Bandura

Each child from groups 2 and 3 was placed one at a time in a room with an adult (model). The child sat in one corner of the room with some toys to play with. The adult sat in the other corner of the room with a variety of toys, as well as a Bobo doll and mallet. The child was told not to play with the Bobo doll or mallet in the adult's corner.

Each child from group 2 was placed in a room with an adult (model). After one minute of playing with the toys, the adult verbally and physically attacked the Bobo doll for a period of ten minutes. Behaviours included throwing the doll, hitting it with the mallet, and punching it while saying 'pow' and 'boom'.

Each child from group 3 was placed in a room with an adult (model). The adult sat quietly and played peacefully with the toys for ten minutes.

For the second part of the experiment, each child was taken into a second room which had toys. To build up the children's levels of frustration, they were told not to play with the toys because they were reserved for other children to play with.

Each child was then taken into a third room which had both 'aggressive' (toy guns, swords etc.) and 'nonaggressive' toys. There was also a Bobo doll and mallet. Each child was left alone in the room and observed by the experimenter through a one-way mirror.

Quantitative (amount of) and qualitative (type of) measures were made of the children's aggressive behaviour.

Results-

- Children who were exposed to the aggressive model (group 2) were more likely to imitate the aggressive behaviour.
- Children who saw the aggressive model (group 2) showed more partial imitation and non-imitation aggression than the children who saw the passive model (group 3) or no model at all (group 1).
- Boys were nearly three times more likely than girls to imitate the physically violent behaviour by a male model.
- Children exposed to the passive model (group 3) or no model at all (group 1) were less likely to display aggressive behaviour.

Conclusion -
Learning can occur in the absence of reinforcers. This finding was in direct contrast to Skinner's theory of operant conditioning.

2. Bandura's 1963a experiment:

For this study, Bandura and colleagues used the same methodology as the 1961 experiment but with three different conditions:

Group 1: live aggressive model (Live)
Group 2: video of the aggressive model (Videotape)
Group 3: aggressive model in cartoon format (Cartoon)
Group 4: live passive model (Control).

Results -

- the children who saw the adult role model behave aggressively in any of the conditions were more likely to behave aggressively themselves later
- the live role model was the most influential
- the children who saw the aggressive video and cartoon models showed almost twice as much aggression as the children in the control group (group 4).

Conclusion -
The results demonstrated that learning can happen vicariously and without any reinforcers given to either the model or the observer.

3. Bandura's 1963b experiment:

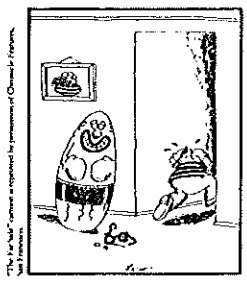
This experiment was similar to the previous ones but this time the conditions were designed to study the influence
of the consequences for the model:
Group 1: (first control group)—highly expressive but non-aggressive models
Group 2: (second control group)—no exposure to models
Group 3: aggressive model rewarded for the aggressive behaviour
Group 4: aggressive model punished for the aggressive behaviour.

The children were then observed for their imitative aggressive responses to the Bobo doll when they were alone in the room with it.

Results –

- Children who had observed the aggressive model rewarded (group 3) showed more imitative aggression and copied their model more than children in the group where the aggressive model was punished (group 4).
- Controlling aggression was vicariously learnt by boys who saw the aggressive model punished (group 4) and by girls through the presentation of incompatible prosocial examples of behaviour.

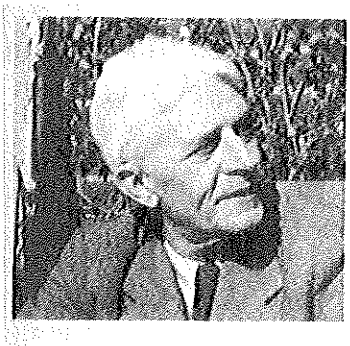
Bandura's classic (1965) study involved a Bo-Bo doll and demonstrated the influence of observational learning on aggression in children:
The study used three groups of children. Each group was shown one of three films. Each film showed an adult punching, kicking, and verbally abusing a large rubber doll named 'Bo-Bo' the clown.



Film #1: aggressive model was rewarded with lollies, soft drink and praised by another adult.
Film #2: aggressive model was punished by spankings and verbal criticism.
Film #3: aggressive model received no consequences whatsoever.
Following the film, each child was placed individually in a room with a one-way mirror and observed.

Some children were offered rewards for imitating the aggressive behaviour; others were not.
Results indicated that children who watched the aggressive model being either reinforced or receiving no consequences for their aggressive behaviour, imitated aggressive behaviour more than the children who watched the aggressive model being punished. However, when a reward was offered to the children for imitating the aggressive behaviour of the model, even those who saw the model punished, tended to imitate the behaviour. That is, some children did not perform what they had learnt from their observations until a reinforcer (reward) was offered as an incentive. And, when it was offered, girls displayed almost as much aggressive behaviour as boys. In fact, differences in levels of aggressive behaviour displayed by children across the three groups were almost negligible when an incentive was offered.

– insight learning as informed by Wolfgang Kőhler



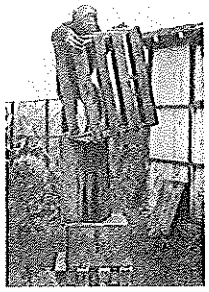
Wolfgang Köhler (Courtesy The Warder Collection)

Insight learning can be defined as a mental process in which a sudden, complete and unexpected solution to a problem is achieved. This is referred to in psychology as the 'Aha!' experience. It is learning that involves a period of mental manipulation of information associated with a problem prior to a sudden realisation of a solution to the problem.

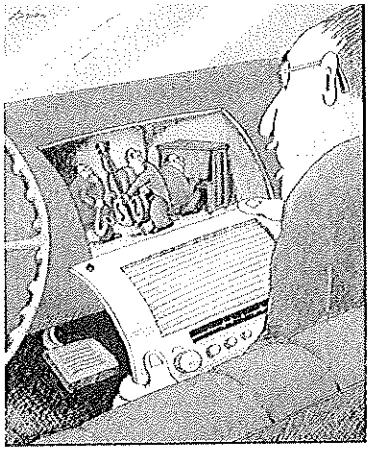
Wolfgang Köhler was experimenting with a chimpanzee called Sultan in 1925. He hung a banana from the ceiling of the room and let Sultan in. Spying the banana, Sultan ran and jumped but couldn't reach it. Unlike Thorndike's cat in the puzzle box, Sultan didn't make lots of attempts to get the banana; he paced around the room and appeared to have forgotten about it. Suddenly, however, he pushed a box under the banana, climbed up, reached the banana and ate it happily!

Main features:

- learning seems to be sudden and complete;
- performance of the solution is usually done with no errors;
- the solution is less likely to be forgotten than if it had been learned by rote;
- the principle underlying the solution is easily applied to other relevant problem solving situations.



Main stages:



"Aha!"

Preparation - gathering as much information as possible and attempting to use it;
Incubation – a period of mental "time-out" during which the problem appears to be "put on the back-burner". However, the information continues to be processed at a lower level of awareness;
Insightful experience – A sudden flash of illumination in which connections/relationships are seen between the elements gathered in the preparation stage. They are put together in such a way as to provide the realisation of a solution. Sometimes referred to as the "ah ah" experience.
Verification – When the individual acts out the behaviour that was visually represented as the solution reached during the insightful experience.

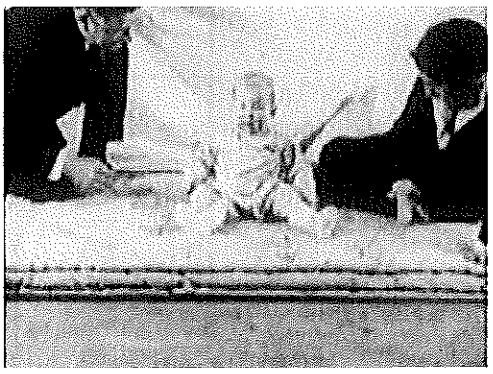
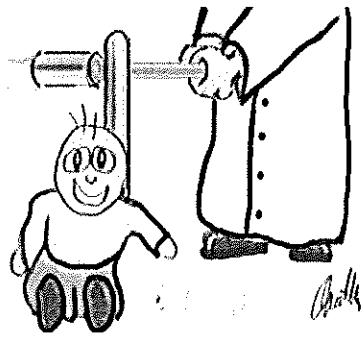
– latent learning as informed by Edward Tolman

Latent learning refers to a situation in which learning has taken place but the behaviour has not yet been demonstrated.

In the 1930s, American psychologist Edward Tolman conducted maze learning studies with rats that highlighted two aspects of learning that challenged the traditional conditioning theories.
The studies indicated that learning can occur *without* reinforcement of observable actions, and learning can occur without revealing itself in observable behaviour.

- **the extent to which ethical principles were applied to classic research investigations into learning including John Watson's 'Little Albert' experiment**

American psychologist, John Watson, and his assistant, Rosalie Rayner (1920), set out to test the notion that fear could be acquired through classical conditioning. Little Albert, the 11-month old son of a female employee at the clinic was the participant in this research. Little Albert was presented with a white laboratory rat -- a stimulus that was neutral in terms of producing a fear response. Little Albert initially showed no fear response. But by associating a loud noise (UCS) with the presentation of the rat (CS), Little Albert acquired an emotional fear response (CR) to the white rat. This conditioned response was then generalised to many other stimuli (white fluffy objects such as a dog and even a sealskin coat). Slightly less fearful responses were elicited to cotton wool balls and a Santa Claus mask. These were all generalisations of the original conditioned stimulus (white laboratory rat).

At least four ethical considerations that were not taken into account in this research include:

(a) Withdrawal rights – Albert had no opportunity to withdraw from the research
(b) Informed consent – it seems that Albert's mother did not give informed consent and may not have given any consent at all
(c) Confidentiality – the findings from this research were made very public without the approval of Albert's mother. Hence Albert's identity was shared with the world in photographs of the experiment.
(d) Debriefing – there was no opportunity for debriefing to occur, so in all likelihood Albert may have suffered some long-term psychological harm